

WHAT IS CLAIMED IS:

1. A method for making a touch activated user input device ⁽⁶⁰⁾
comprising:
5 providing a first substrate ⁽²⁰⁾ comprising a first conductive coating;
ink jet printing ^(Screen printing) a plurality of dots ⁽³⁰⁾ on the first conductive coating;
hardening the dots to form spacers adhered to the first substrate; ^(4, 52-59)
and
placing a second substrate ⁽⁵⁰⁾ comprising a second conductive coating
10 over the first substrate such that the spacers maintain a distance between the first
and second substrates to prevent detection of a touch location when no external
force is applied and allow detection of a localized touch location when a
sufficient localized external force is applied between the first and second
substrates. ^(5, 5-24)
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2. The method of claim 1, wherein the dots comprise a
nanocomposite comprising surface-modified inorganic nanoparticles. ^(2, 65-66)
3. The method of claim 2, wherein the surface-modified inorganic
20 nanoparticles include silica nanoparticles. ^(3, 3-5)
4. The method of claim 2, wherein the nanoparticles are present in an
amount of about 5% or more by weight of the nanocomposite.
25 5. The method of claim 2, wherein the nanoparticles are present in an
amount of about 10% to 40% by weight of the nanocomposite.
^{may be} 6. The method of claim 2, wherein the nanoparticles have an average
diameter in a range of about 10 to 30 nm. ^{6, 33-42}

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7. The method of claim 2, wherein the nanocomposite further comprises hexanediol diacrylate.

8. The method of claim 1, wherein the step of ink jet printing a plurality of dots comprises ink jet printing a heated gel composition.

9. The method of claim 8, wherein the gel composition comprises a nanocomposite gel.

10. ⁽³⁾ The method of claim 9, wherein the nanocomposite gel composition comprises surface-modified silica nanoparticles dispersed in an energy curable fluid vehicle.

11. The method of claim 10, wherein the energy curable fluid vehicle comprises hexanediol diacrylate.

12. The method of claim 10, wherein the silica nanoparticles are present in an amount of about 5% or more by weight of the nanocomposite gel.

13. The method of claim 10, wherein the silica nanoparticles are present in an amount of about 10% to 40% by weight of the nanocomposite gel.

14. ⁽⁶⁾ The method of claim 10, wherein the silica nanoparticles have an average diameter of about 10 to 30 nm.

15. The method of claim 1, wherein the first and second conductive coatings each comprise a transparent conductive coating.

16. The method of claim 1, wherein the spacer dots have heights of about 2 microns or more and have height to diameter aspect ratios of about 1:10 or more.

17. The method of claim 1, wherein the step of ink jet printing comprises ink jet printing a material onto a pre-existing dot.

5 18. The method of claim 1, further comprising associating the touch activated user input device with an electronic display.

19. A method for forming dots suitable as spacers in touch panels, which method comprises the steps of:

10 providing curable gel composition;
heating the gel composition to form a liquid composition;
ink jetting the liquid composition onto a transparent conductive coating to form a plurality of dots;

cooling the dots into a gel state; and
15 curing the dots to adhere the dots to the transparent conductive coating,

wherein the cured dots have heights of about 2 microns or more, and have height to diameter aspect ratios of about 1:10 or more.

20 20. The method of claim 19, wherein the curable gel composition comprises a nanocomposite.

21. The method of claim 20, wherein the nanocomposite comprises silica nanoparticles dispersed in a binder material.

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22. The method of claim 21, wherein the binder material comprises an acrylate material.

23. The method of claim 19, wherein the transparent conductive
30 coating comprises indium tin oxide.

24. A method for making touch panel spacer dots comprising:
printing a nanocomposite composition comprising surface-
modified inorganic nanoparticles dispersed in an energy curable fluid vehicle to
form a plurality of curable dots on a conductive coating; and
5 curing the curable dots to adhere the dots to the conductive
coating.

25. The method of claim 24, wherein the step of printing the
nanocomposite composition comprises ink jet printing.

26. The method of claim 25, wherein ink jet printing comprises
heating the composition, ink jetting the heated composition, and cooling the ink
jetted composition to form the plurality of curable dots.

27. The method of claim 24, wherein the step of printing the
nanocomposite composition comprises screen printing.

28. The method of claim 24, wherein the nanocomposite composition
comprises a nanocomposite gel composition.

29. The method of claim 24, wherein the nanocomposite composition
comprises silica nanoparticles.

30. The method of claim 24, wherein the nanoparticles are present in
an amount of about 5% or more by weight of the nanocomposite composition.

31. The method of claim 24, wherein the nanoparticles are present in
an amount of about 10% to 40% by weight of the nanocomposite composition.

32. The method of claim 24, wherein the nanoparticles have an
average size of about 10 to 30 nm.

33. The method of claim 24, wherein the nanocomposite further comprises hexanediol diacrylate.

5 34. The method of claim 24, wherein the conductive coating comprises a transparent conductive oxide.

35. The method of claim 34, wherein the transparent conductive oxide comprises indium tin oxide.

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36. A method of making touch panel spacer dots comprising:
selecting a transparent conductive coating suitable for use in a touch panel;

15 formulating a curable gel composition capable of (i) being ink jet printed onto the transparent conductive coating to form a droplet on the transparent conductive coating that has a height to diameter aspect ratio of about 1:10 or more for droplets having height of about 2 to 10 microns or more, and (ii) adhering to the transparent conductive coating upon curing, without modifications to the transparent conductive coating.

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37. The method of claim 36, wherein the curable gel composition comprises a nanocomposite gel composition.

25 38. The method of claim 37, wherein the nanocomposite gel composition comprises surface-modified silica nanoparticles dispersed in a binder.

39. The method of claim 38, wherein the binder comprises an acrylate material.

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40. The method of claim 38, wherein the silica nanoparticles are present in an amount of about 5% or more by weight of the nanocomposite gel.

41. The method of claim 38, wherein the silica nanoparticles are
5 present in an amount of about 10% to 40% by weight of the nanocomposite gel.

42. The method of claim 38, wherein the silica nanoparticles have average diameters of about 10 to 30 nm.

10 43. The method of claim 36, wherein selecting a transparent conductive coating comprises selecting an indium tin oxide coating.

44. A touch panel comprising:
a first substrate comprising a first conductive coating;
15 a second substrate comprising a second conductive coating; and
a plurality of spacer dots disposed between the first and second substrates to maintain a distance between the first and second substrates to prevent detection of a touch location when no external force is applied and allow detection of a localized touch location when a sufficient localized external force
20 is applied between the first and second substrates,
wherein the plurality of spacers dots comprise a nanocomposite material comprising about 5% or more by weight of surface-modified inorganic nanoparticles.

25 45. The touch panel of claim 44, wherein the nanocomposite material comprises about 10% to 40% by weight of surface-modified inorganic nanoparticles.

46. The touch panel of claim 44, wherein the surface-modified
30 inorganic nanoparticles comprise silica particles.

47. The touch panel of claim 44, wherein the nanocomposite further comprises an acrylate material.

48. The touch panel of claim 44, wherein at least one of the first and
5 second conductive coatings comprises a transparent conductive coating.

49. A method for making touch panel spacer dots comprising:
providing a touch panel substrate comprising a plurality of spacer
dots;
10 inspecting the substrate for missing or damaged spacer dots; and
ink jet printing material to fill in or repair a missing or damaged
spacer dot identified in the inspecting step.

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50. A display system comprising a touch panel comprising:
15 a first substrate;
a second substrate disposed over the first substrate; and
a plurality of spacer dots disposed between the first and second
substrates, wherein said spacer dots are formed by ink jet printing.

20 51. A display system comprising a touch panel comprising:
a first substrate;
a second substrate disposed over the first substrate; and
a plurality of spacer dots comprising a nanocomposite material
including about 5% or more by weight of surface-modified inorganic
25 nanoparticles.